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TECHNICAL REVIEW COMMENTS ON THE HUMAN HEALTH RISK ASSESSMENT AND FUGITIVE DUST DISPERSION MODELING FOR THE STANDLEY LAKE DIVERSION PROJECT

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1.0 INTRODUCTION

PRC Environmental Management, Inc. (PRC) conducted a technical review of the Human Health Risk Assessment and the Fugitive Dust Dispersion Modeling for the Standley Lake Diversion Project (SDLP) (operable unit [OU] 3). These documents were prepared by the Cities of Westminster, Northglenn, and Thornton in March 1993 and submitted for review to the U.S. Environmental Protection Agency (EPA). PRC's review is divided into general and specific comments. General comments address the overall quality of the documents and specific comments focus on individual sections of the risk assessment and modeling report.

2.0 GENERAL COMMENTS

With the exception of three issues, the overall the approach used in the risk assessment has been well thought out and implemented. It closely follows the methodology suggested in the Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation, Part A (RAGS) (EPA, 1989). The three problem areas involve the conceptual exposure model used to identify all possible exposure pathways and putative human receptors, the omission of environmental media, and the elimination process used to exclude chemicals during the selection of chemicals of concern (COCs).

1. Of primary concern is the tacit assumption that residents and recreational receptors are two separate and distinct receptor populations, when in fact they are likely to represent the same exposed population. The proximity of the residential neighborhood to the park increases the likelihood that the most frequent visitors to Standley Lake will be the residents who live nearby. Consequently, it should be assumed that residents will receive two types of exposures, first as a resident and second as an occasional recreational visitor. In failing to recognize this possibility, the conclusions narrowly describe only those risks for separate receptor groups, not the maximum exposed receptor. This is not an unsurmountable problem in the risk assessment, however, since the presentation of residential and recreational risks allows the cumulative risks to be aggregated. It should be pointed out, however, that this simple manipulation of the results probably overestimates the human health risks because it assumes that residents are two places at once. That is, the exposure duration for a resident is 24 hours, 350 days per year for 30 years, which allows little time for exposure as a

recreational receptor. Nonetheless, as a conservative first approximation, the cumulative risks resulting from summing the risks from residential and recreational exposures indicate that risks are insignificant. It may still be worth the effort to determine the risks to the maximum exposed individual by taking into consideration residents will also be recreational visitors, since the exposure point concentrations for all contaminants will be much higher in the construction area than at their residences.

2. Another shortcoming of the risk assessment is the omission of any description of receptor contact with sediments or surface water. Construction activities will almost certainly create increased contaminant concentrations in Woman Creek and downgradient in Big Dry Creek through resuspension of sediments which currently sequester heavy metals and radionuclide contaminants. Under normal circumstances this natural phenomenon of heavy metal and radionuclide immobilization prevents direct contact with human receptors. However, when sediment contaminants are disturbed and displaced downgradient, they could affect Big Dry Creek and pose health hazards via direct incidental ingestion of surface water during swimming and indirect activities such as fishing. It is important for the risk assessment to acknowledge that because the maximum impacted region is likely to be downgradient near Big Dry Creek where residents are primarily located, the possibility for exposure to sediment contaminants is greater than currently recognized. Moreover, since the predicted future land use is further development of parks to be used for camping, picnicking, and fishing, recreational exposure should also be increased. At a minimum, these issues should be qualitatively evaluated.

3. The one remaining questionable aspect of the risk assesment involves background comparisons. The method used to eliminate chemicals from the list of COCs is untenable at best. Concentrations taken from literature sources do not typically represent site-specific conditions and should not be used to eliminate chemicals from the quantitative risk assessment. It is not unusual for the reported concentration range for some chemicals to span two or three orders of magnitude. In many cases, the high end of the concentration range represents geographical locations abnormally concentrated with a particular chemical. For example, levels of arsenic, cadmium, and lead are typically elevated at mining sites and correspond to the maximum reported values. Rather than representing the upper range of

naturally occurring metals, they should be viewed as outliers in the distribution and defined as anomalies. Thus, it would be inappropriate to compare these data points with site-specific data at nonmining sites such as the RFP. This point is alluded to in the one isolated statement that, "These background values represent statewide variations and may not depict site-specific concentrations." However, the final results and conclusions of the background comparison are not caveated or otherwise qualified. In addition to the ambiguity surrounding background areas used in the comparisons, actual background concentrations used in the risk assessment to eliminate chemicals from the list of COCs are not provided. This lack of basic information precludes verification of the background comparison. To circumvent the problems inherent in using background literature sources, it would be prudent to eliminate essential nutrients and infrequently detected chemicals and then carry all remaining inorganic chemicals detected at least once in OU3 through the quantitative risk assessment.

PRC independently evaluated all modeling, intake, and risk calculations and was able to verify the results within error ranges attributable to rounding off significant figures. The only discernable errors involved transposed values. However, even in these few and isolated cases, recalculations conducted by PRC with the correct values indicated that risks did not significantly differ from those presented. All results appear to still support the conclusion that under the specific exposure assumptions described in the document, no unacceptable human health risks will be associated with the SLDP activities. PRC, however, did not evaluate the quality or validity of the data supporting the conclusions of this risk assessment. Consequently, this review was conducted under the premise that the data represent and fully characterize the OU3 construction area.

3.0 SPECIFIC COMMENTS

The following are on: The Human Health Risk Assessment for the Standley Lake Diversion Project.

1. Page 2-2, Table 2-1 and Page 2-10, Last Paragraph. This table identifies the chemical analytes, but no additional information is provided. By convention, a summary list of all chemicals detected at least once in OU3 should be presented along with basic statistical information including the frequency of detection, range of detected concentrations, arithmetic

or geometric mean concentration, and the upper 95 percent confidence limit of the mean concentration. Without this information it cannot be ascertained that the correct COCs were selected for OU3.

Rationale: Summary statistics of all detected chemicals should be tabulated or discussed as a starting point for the risk assessment.

2. Page 2-14, First Paragraph. This paragraph describes the process to eliminate chemicals from the list of COCs based on background concentrations. As previously noted, it significantly deviates from commonly accepted practice and is not consistent with the methodology detailed in the RAGS (EPA, 1989). It is also unclear whether a background comparison was carried out for any environmental medium other than soil, such as surface water and sediments. These are two important environmental media that should at least be discussed since a reservoir and diversion canal will be constructed from Woman Creek to Big Dry Creek around Standley Lake. The risk assessment virtually ignores that the project will involve diversion of surface water with associated sediments.

Rationale: It is untenable to use the maximum published background concentration to eliminate chemicals in the risk assessment. Background information should be reported for surface water and sediments as well as soil.

3. Page 4-4, Section 4.2. This section identifies exposure pathways associated with construction activities during the project, but ignores all exposure routes involving surface water. Surface water should be considered.

Rationale: Surface water should be discussed with regard to potential direct and indirect exposure.

4. Page 4-4, Last Paragraph. This paragraph states that construction activities will generate dust throughout construction activities, which are expected to last 1 year. After this exposure duration, residential exposure is presumed to cease. However, once resuspended dust is deposited in residential neighborhoods it will remain at these locations and continue to be

resuspended in a cyclical manner throughout the entire exposure duration for residents, which is 30 years, not 1 year. Accordingly, a 1-year exposure duration can underestimate contaminant intake and human health risks. The deposition analysis presented in Section 5.3.5 narrowly addresses this issue and is not the comprehensive analysis necessary to unequivocally conclude the estimated risks are negligible.

Rationale: A 30 year exposure duration should be used to estimate risks for residential exposure.

5. Page 4-6. Last Section. This section does not include inhalation of contaminated particulates for future recreational exposures. This pathway could ultimately be the dominant route of exposure. It could also significantly contribute to the aggregate risk if residents are also assumed to be recreational receptors.

Rationale: All possible exposure pathways should be considered.

6. Page 4-7. Third Paragraph. This paragraph states that an inhalation route of exposure was not considered for the future recreational scenario because "the ground within and surrounding the canal area is expected to be covered with concrete, grass, or other ground cover that will prevent wind erosion and significant dust generation." This presumption cannot be substantiated, since no plans for the area have been submitted to the EPA. While ground cover can prevent attenuate inhalation exposures by suppressing resuspended dust, institutional controls should not be considered in a risk assessment. Furthermore, if ground cover was a planned activity and allowed to be evaluated as an institutional control, dust suppression would still not be completely eliminated. Due to the frequently occurring, high and gusting winds in the area, inhalation of particulates will likely remain a significant exposure pathway even after the ground is covered. Eliminating the inhalation pathway based on a ground cover assumption is tantamount to eliminating exposures to all hazardous wastes by simply assuming a fence or barrier will be erected around the site.

Rationale: Ground cover should not be used to mitigate inhalation exposure.

The following are comments on: Fugitive Dust Dispersion Modeling for th Standley Lake Diversion Project.

7. Page 3-1, Section 3.1. The Fugitive Dust Model (FDM) is used in the risk assessment to calculate contaminant concentrations. The FDM is a widely-used model to derive exposure point concentrations. However, due to the complexity of the calculations, the FDM is not as efficient as other models. This is particularly true when multiple contaminant sources are involved, as in the present modeling. It can take days to complete one computer run.

   The Industrial Source Complex Long Term (ISCLT) or Industrial Source Complex Short Term (ISCST) models are the models preferred by EPA in Region 8.

   Rationale: The use of the ISCLT or ISCST models should be considered for future dust dispersion modeling.

8. Page 3.1, Section 3.3. The document states that meteorological data from Stapleton Airport were used as the input data set. Stapleton Airport meteorological data are less representative of OU3 than data collected at RFP. Meteorological data at both 10-meter and 60-meter heights have been collected at the RFP for several years. These data should be used as the input data.

   The use of Stapleton data over the more appropriate RFP data will result in different modelled concentrations. This difference is difficult to determine without conducting an extensive sensitivity analysis. However, the difference could be approximately 20 to 30 percent.

   Rationale: Meteorological data from RFP should be used to represent OU3 conditions.

9. Page 4.1, Section 4. It is unclear if the modelled concentrations are calculated from the cumulative effects of all the defined sources. It is possible that calculations represent contaminant concentrations calculated individually from the sources. The contaminant concentrations should be calculated from the summed effect of all the defined sources. Additionally, the document should clearly define all input terms used in the FDM model.

Calculating contaminant concentrations separately from individual sources rather than the aggregate effect of all the defined sources will result in different modelled concentrations. This difference is difficult to determine without an extensive sensitivity analysis. However, the difference could be two to three orders of magnitude.

Rationale: Source terms should be clarified.

4.0 REFERENCES

EPA 1989a. U. S. Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989.